

POLLEN MORPHOLOGY IN NINE SPECIES OF JUTE (*CORCHORUS*)

SUSMITA MAITY, ANIMESH K DATTA*, SANDIPAN CHOWDHURY and G. G. MAITI

Department of Botany, University of Kalyani, Kalyani - 741235, West Bengal, India.

*Email: dattaanimesh@gmail.com.

A comparative study of pollen morphology (shape, size, colpi length, colpi margin, pore character, exine surface and cellular features) of two cultivated (*Corchorus olitorius* L. and *C. capsularis* L.) and seven wild (*C. fascicularis* Lam., *C. aestuans* L., *C. pseudoolitorius* Islam and Zaid., *C. pseudocapsularis* L., *C. tridens* L., *C. trilocularis* L. and *C. urticaefolius* Lam.) species of jute (Family: Tiliaceae) have been made based on acetolysis technique and SEM analysis. Pollens in the species were subprolate (exception: *C. pseudocapsularis* – prolate); tricolporate (excepting *C. trilocularis* had both tricolporate – 90.0% and tetracolporate – 10.0% pollen grains), colpi margin normal or incurved, size of colpi medium to relatively longer and varied from $29.98\mu\text{m} \pm 0.64$ to $36.72\mu\text{m} \pm 0.92$; pore alongate with edges raised or inconspicuous; exine surface reticulate, reticulation indistinct or distinct, tri-to penta-gonal or variously gonals, shallow to alveolate or pitted, sometimes angular with raised irregularly walls, junction knobbed or unknobbed. Pollen size is variable among the species (evidenced from χ^2 – test of heterogeneity; $p < 0.01$ for polar axis and $p < 0.001$ for equatorial diameter) and it ranges from $38.30\mu\text{m} \pm 0.54 \times 30.45\mu\text{m} \pm 0.54$ (*C. capsularis*) to $31.17\mu\text{m} \pm 0.64 \times 24.2\mu\text{m} \pm 0.55$ (*C. trilocularis*). A key to the identification of the species has been prepared and presented.

Keywords: *Corchorus*; Key; Pollen morphology; SEM.

Introduction

Pollen grains have selective advantages as it can be stored in a viable condition for a considerable length of time for use throughout the year and therefore, become favorite system for studying range of biological problems in both fundamental and applied areas¹. Pollen detailing in terms of its morphological variation has been considered to be an useful approach to delineate taxonomic relationship among plant taxa at different level²⁻³. The present investigation documents a comparative study of pollen morphology (shape, size, colpi length, colpi margin, pore character, exine surface and cellular features) of two cultivated (*Corchorus olitorius* L. and *C. capsularis* L.) and seven wild (*C. fascicularis* Lam., *C. aestuans* L., *C. pseudoolitorius* Islam and Zaid., *C. pseudocapsularis* L., *C. tridens* L., *C. trilocularis* L. and *C. urticaefolius* Lam.) species of jute (Family: Tiliaceae) based on acetolysis technique and SEM analysis with the view to characterize the species aiding to the breeding behaviour of the crop.

Material and Methods

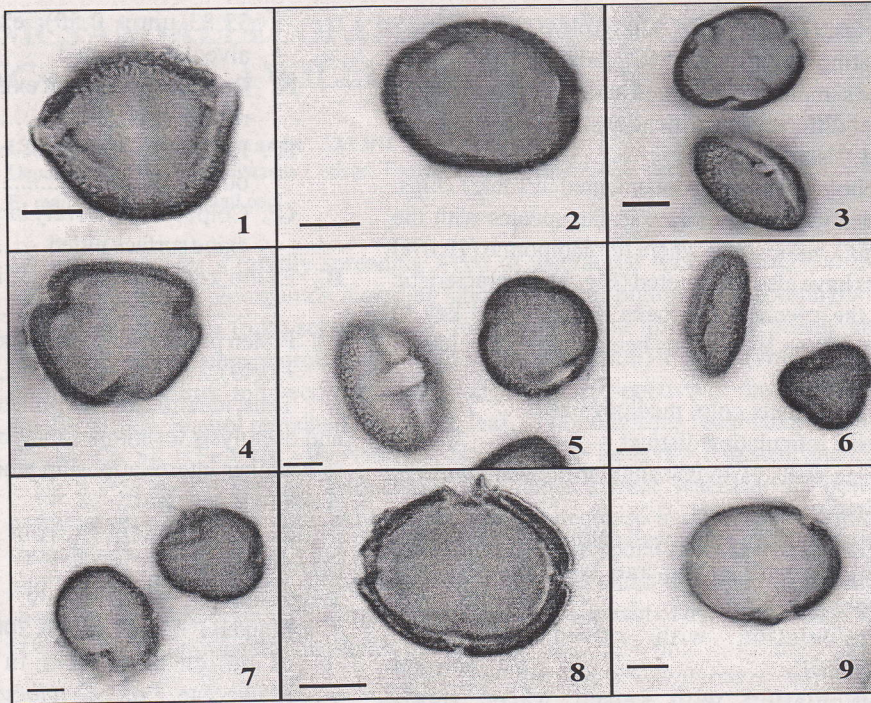
Pollens from 9 species of Jute (*C. olitorius* L. - JRO-524, *C. capsularis* L.-JRC-321, *C. fascicularis* Lam.-WCIJ-150, *C. aestuans* L.-WCIJ-088, *C. pseudoolitorius* Islam

and Zaid.-OIN-507, *C. pseudocapsularis* L.-CIM-036, *C. tridens* L.-WCIJ-149, *C. trilocularis* L.-KBA-222 and *C. urticaefolius* Lam.-WCIJ-070, obtained following the courtesy of Dr. Mohit Sinha, CRIJAF, Nilgunj, West Bengal), were collected from fully opened flowers and acetolysis method⁴ was adopted. The pollen grains were treated in a mixture of acetic anhydride and concentrated sulphuric acid (9:1) and the suspension was heated to boiling. The acetolysis mixture was removed and the pollen grains were rinsed, first in glacial acetic acid and then in water, and mounted in glycerin. They were examined under compound microscope (10x×40x) and their measurements were taken in micrometer.

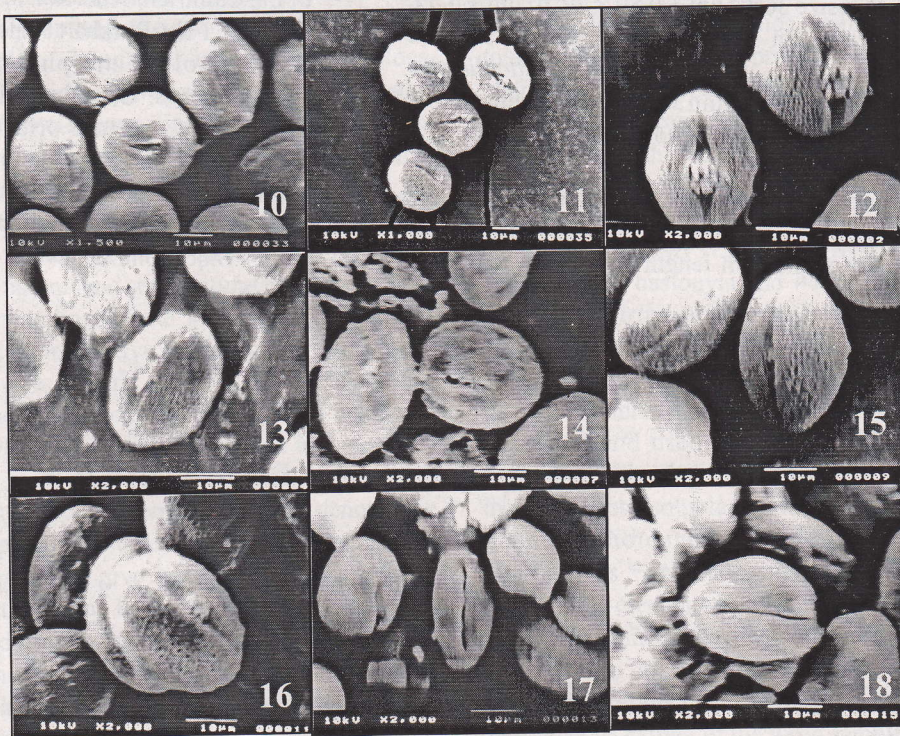
For SEM study, the pollen grains of each species were put into 70% ethanol for 2 – 3 days in the eppendorf tubes and cleaned in an ultrasonic vibrator (Bran Sonic 221) for 4 – 10 min. Pollen grains of each species were fixed in glass plates and then mounted to specimen stubs with the double sided adhesive tape and silver painted. Pollen grains, mounted on the respective stubs, were placed on the revolving disc and coated with 200-300 Å thick gold in a vacuum evaporator of (Polaron) sputter coating system. The specimen stubs were then observed

Table 1. Pollen characteristics in *Corchorus* spp.

Name of the species	Pollen shape	Pollen Size (μm)		Colpi length (μm)	Colpi margin	Pore character	Exine surface	Cellular features
		Polar axis	Equatorial diameter					
<i>C. olitorius</i> (Figs.-1, 10)	Subprolate	35.61 \pm 1.12	29.53 \pm 0.82	33.82 \pm 0.72	Incurved	Raised edges	Reticulate	Variously angular, bounded with raised walls, regularly knobbed at the corners
<i>C. capsularis</i> (Figs.-2, 11)	Subprolate	38.30 \pm 0.54	30.45 \pm 0.54	34.10 \pm 0.73	Normal	Inconspicuous	Reticulate	Indistinct compartmentation
<i>C. fascicularis</i> (Figs.-3, 12)	Subprolate	34.83 \pm 0.64	27.13 \pm 0.53	33.83 \pm 0.55	Incurved	Inconspicuous	Reticulate	Indistinct, shallow to alveolate
<i>C. aestuans</i> (Figs.-4, 13)	Subprolate	31.63 \pm 0.71	26.13 \pm 0.43	30.25 \pm 0.68	Incurved	Inconspicuous	Reticulate	Shallow to pitted, oblong
<i>C. pseudooolitorius</i> (Figs.-5, 14)	Subprolate	36.12 \pm 0.80	29.70 \pm 0.55	33.00 \pm 0.29	Normal	Raised	Reticulate	Irregularly, variously gonals; walls raised
<i>C. pseudocapsularis</i> (Figs.-6, 15)	Prolate	36.30 \pm 0.37	23.65 \pm 0.36	36.03 \pm 0.49	Incurved	Inconspicuous	Reticulate	Shallow to pitted, mostly oblong
<i>C. tridens</i> (Figs.-7, 16)	Subprolate	37.22 \pm 1.04	31.17 \pm 0.58	36.72 \pm 0.92	Normal	Raised	Reticulate	Pitted to variously angular
<i>C. trilocularis</i> (Figs.-8, 17)	Subprolate	31.17 \pm 0.64	24.20 \pm 0.55	29.98 \pm 0.64	Normal	Raised	Reticulate	Variously angular, bounded with raised irregular walls
<i>C. urticaefolius</i> (Figs.-9, 18)	Subprolate	34.28 \pm 0.75	26.03 \pm 0.70	32.17 \pm 0.47	Normal	Raised edges	Reticulate	Distinct, tri.-pentagonal, knobbed at the point of junction or corner



Figs. 1-9. Pollens (acetolysis method) of *Corchorus* spp. 1. *C. olitorius*. 2. *C. capsularis*. 3. *C. fascicularis*. 4. *C. aestuans*. 5. *C. pseudoolitorius*. 6. *C. pseudocapsularis*. 7. *C. tridens*. 8. *C. trilocularis*. 9. *C. urticaefolius*. Scale bar: 10µm.



Figs. 10-18. Pollens (SEM study) of *Corchorus* spp. 10. *C. olitorius*. 11. *C. capsularis*. 12. *C. fascicularis*. 13. *C. aestuans*. 14. *C. pseudoolitorius*. 15. *C. pseudocapsularis*. 16. *C. tridens*. 17. *C. trilocularis*. 18. *C. urticaefolius*.

under SEM test (Model- JSM 5200 Tokyo, Japan) at 25 KV accelerating voltage at USIC, Jadavpur University, Kolkata. The samples were viewed and photomicrographs were taken at different magnifications.

Results and Discussion

Pollen morphology has been documented in Table 1 (Figs. 1-18). Pollens were tricolporate in the species with the exception of *C. trilocularis* where tetracolporate (10.0%) pollen grains have also been noted (Fig. 8). Characteristic features in the species have been outlined and key to identification of the species has been presented below.

Key to species.....

- A. Pollen subprolate; colpi medium sized
 - B. Exine reticulation distinct
 - C. Exine walls variously angular-bounded with raised walls.
 - D. Reticulation of exine wall distinct with 3-5 gonal regions; wall raised and knobbed or rarely knobbed.
 - E. Reticulation with raised walls and knobbed.....*C. olitorius*
 - E'. Reticulation with raised walls, rarely knobbed.....*C. urticaefolius*
 - D'. Reticulation of exine walls variously gonals; walls raised but not knobbed.
 - F. Pollen size $36.12 \mu\text{m} \pm 0.80 \times 29.70 \mu\text{m} \pm 0.55$; reticulation distinct with pitted surface*C. pseudoolitorius*
 - F'. Pollen size $31.17 \mu\text{m} \pm 0.64 \times 24.20 \mu\text{m} \pm 0.55$; reticulation inconspicuous*C. trilocularis*
 - C'. Exine walls indistinct with shallow to pitted surface
 - G. Colpi of medium length ($30.25 \mu\text{m} \pm 0.68$ to

$33.83 \mu\text{m} \pm 0.55$); exine surface shallow to alveolate to pitted.

- H. Reticulate region of exine surface with indistinct margin or border.....*C. fascicularis*
- H'. Reticulate region of exine surface oblong in outline.....*C. aestuans*
- G'. Colpi comparatively larger ($36.72 \mu\text{m} \times \pm 0.92$); exine surface pitted.....*C. tridens*
- B'. Exine reticulation not distinct, inconspicuous*C. capsularis*
- A'. Pollen prolate; colpi comparatively longer ($36.03 \mu\text{m} \pm 0.49$).....*C. pseudocapsularis*

Thus, identification of pollen characters through SEM and acetolysis techniques may be an additional constant to decipher interrelationship among *Corchorus* spp.

Acknowledgement

Financial assistance from ICAR is gratefully acknowledged.

References

1. Mandal P K and Das P K 2004, Comparative account of pollen characters in the Compositae and Malvaceae. *Proc. Cytology and Genetics* (Ed.G. K. Manna and S.C. Roy). Vol. XI. pp. 415-424.
2. Cooper R L, Osborn J M and Philbrick T 2000, Comparative pollen morphology and ultrastructure of the Callitrichaceae. *Am. J. Bot.* 87 161-175.
3. Banks H, Feist-Burkhart S and Klitgaard B 2006, The unique pollen morphology of *Duparquetia* (Leguminosae: Caesalpinioideae): developmental evidence of aperture orientation using confocal microscopy. *Ann. Bot.* 98 (1) 107-115
4. Erdtman G 1952, In: *Pollen Morphology and Plant Taxonomy- Angiosperms*, Almquist and Wiksell (Eds.), Stockholm. pp. 6-10.